

REMARKS

Reconsideration of the Office Action of November 16, 2007 is respectfully requested.

Claims 1-3, 5-7, 9-11, 26, 29, 31, 32 and 34-37 were pending in this application and have been rejected in the Office Action..

To summarize the claim changes made in this Amendment, claims 2, 3, 34, 35 and 37 has been amended.

No new matter is considered to be introduced by these amendments.

Claim Rejections - 35 U.S.C. §112, first paragraph

Claims 2, 3, 34 and 35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

With regard to claim 2, claim 2 has been amended as below:

Claim 2: The differential limiting control apparatus as set forth in claim 1, wherein:

the first control unit comprises:

a first clutch torque computing unit for computing the deviation between the target differential speed and the actual differential speed, and computing the first clutch torque by applying a sliding mode control with a switching function using at least a polarity related to an integral term of the deviation.

Applicants respectfully submit that current claim 2 is considered to comply with the enablement requirement under 35 U.S.C. 112, first paragraph, since the subject matter in current claim 2 is described in the specification in such way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

For example, “computing the deviation between the target differential speed and the actual differential speed” is described on page 32, line 19 to page 34 line 3, especially equations (13)-(16), and “computing the first clutch torque by applying a sliding mode control with a switching function

using at least a polarity related to an integral term of the deviation” is also described on page 32, lines 19 to page 44, lines 22, especially, equations (17)-(28) and (33) and the disclosure on page 39, line 17 – page 40, line 14.

Thus, it is respectfully submitted that claim 2 complies with the enablement requirement.

With regard to claims 3, 34 and 35, it is respectfully submitted that current claims 3, 34 and 35 are considered to comply with the enablement requirement under 35 U.S.C. 112, first paragraph, since the subject matters in current claims 3, 34 and 35 are described in the specification in such way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

For example, computations for the final clutch torque as claims 3, 34 and 35 are described on page 46, line 3 to page 50, line 3, especially equations (34) and FIG 7 and the disclosure on page 49, lines 7-20.

With regard to claims 3 and 34, as one example, “a first ratio coefficient value” and “a second ratio coefficient value” correspond to “ R_{tr} ” and “ $(1-R_{tr})$ ”, respectively.

With regard to claim 35, as one example, “a contributing value associated with the first clutch torque in the computation of the final clutch torque” and “a contributing value associated with the second clutch torque in computation of the final clutch torque” correspond to a percentage of the term “ $(1-R_{tr}) \cdot T_{lsdfb}$ ” with respect to the final clutch torque “ T_{lsd} ”, and a percentage of the term “ $R_{te} \cdot T_{lsdff}$ ” with respect to the final clutch, respectively. In other words, a contributing value associated with the first clutch torque in the computation of the final clutch torque corresponds to a value that depends on, for example, “ $(1-R_{tr}) \cdot T_{lsdfb}$ ” divided by “ T_{lsd} ”, and a contributing value associated with the second clutch torque in the computation of the final clutch torque corresponds, for example, to a value that depends on “ $R_{te} \cdot T_{lsdff}$ ” divided by “ T_{lsd} ”.

Thus, it is respectfully submitted that claims 3, 34 and 35 comply with the enablement requirement.

Claim Rejections - 35 U.S.C. §112, second paragraph

Claims 3 and 35 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants respectfully submit that the rejections have been overcome by way of the amendments to claims 3 and 35.

Claim Rejection - 35 U.S.C. §103

Claims 1-3, 5-7, 9-11, 26, 29, 31, 32, 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al (US 2002/0005077) in view of Drexel (US 6,040,768).

Applicants respectfully submit that Ozaki et al in view of Drexel fail to disclose or suggest the features of independent claim 1.

Independent Claim 1

Regarding claim 1, the Examiner recites:

Ozaki (figs. 1, 2; abstract, sec. 0042-0046) disclose a differential limiting control apparatus for a vehicle having a clutch unit (3, 16, 19) interposed between one rotational shaft 2 and another rotational shaft 9 (fig. 1, sec. 0042-0046) for variably changing a driving force transmission between the one rotational shaft 2 and the other rotational shaft 9, comprising:

a1) a target differential speed setting unit for setting a target differential speed between the one rotational shaft and the other rotational shaft (sec. 0063);

a2) an actual differential speed detecting unit for detecting an actual differential speed between the one rotational shaft and the other rotational shaft (sec. 0063);

a3) a first control unit for comprising unit for computing a first clutch torque (FF) of the clutch unit based on a deviation between a target differential speed and an actual differential speed (sections abstract, 0021, 0025, 0054, 0057, 0063-0080; figs, 1-4, 8-13);

a4) a second control unit for computing a second clutch torque (FB) of the first clutch unit based on a throttle opening amount (sections abstract, 0021, 0025, 0031, 0054, 0057, 0063-0080; figs, 1-4, 8-13);

a5) a final clutch torque computing unit (figs 1, 12) for computing a final clutch torque (assist clutch), wherein the final clutch torque computing unit computes the final clutch torque by a

computation involving the first clutch torque and the second clutch torque (see assist clutch computed from FF and FB, steps 2072 to 2075; sec. 0074) in association with a ratio (i.e. gear ratio of transmission, abstract, sec. 0067) so as to suppress a wheel slippage (sec. 0067)

The examiner acknowledges in the Office Action that Ozaki does not disclose “tire diameter”, and “diameter difference of the tire”. In an effort to remedy these deficiencies reliance is placed on Drexel. Namely, Drexel is said to teach of a differential limiting control apparatus for a vehicle having a clutch unit interposed between one rotational shaft and another rotational shaft for variably changing a driving force transmission between the one rotational shaft and the other rotational shaft, comprising:

a6) computing a ratio coefficient (i.e. a transmission ratio), which ratio coefficient value changes according to a diameter difference of a tire (col. 3, lines 10-25; col. 7, lines 57 to col. 8, lines 14, abstract).

With regard to the Examiner’s assertion that Ozaki discloses a differential limiting control apparatus, Applicants respectfully submit that Ozaki fails to disclose a differential limiting control apparatus. It is respectfully submitted that Ozaki only discloses an automatic transmission.

With regard to a1), Applicants respectfully submit that Ozaki fails to disclose a target differential speed setting unit for setting a target differential speed between the one rotational shaft and the other rotational shaft. It is respectfully submitted that Ozaki only discloses a target revolution speed trajectory setting unit 103 sets a trajectory of the aimed revolution speed of the transmission input shaft 4 on the basis of the characteristic diagram of FIG. 7 (see sec. 0062 and 0063 of Ozaki).

With regard to a2), Applicants respectfully submit that Ozaki fails to disclose an actual differential speed detecting unit for detecting an actual differential speed between the one rotational shaft and the other rotational shaft. It is respectfully submitted that Ozaki only discloses a sensor 20 for outputting an input shaft revolution speed of the transmission (see sec. 0063 of Ozaki).

With regard to a3), Applicants respectfully submit that Ozaki fails to disclose a first control unit for computing a first clutch torque (FF) of the clutch unit based on a deviation between a target differential speed and an actual differential speed. It is respectfully submitted that Ozaki only discloses an assist clutch transmission torque FF command setting unit 102 that sets a feed forward command value for the assist clutch transmission torque based on the revolution speed of the input shaft 4, the shift diagram, gearshifting time, engine torque and second/third clutch release/engagement judgment trigger (see sec. 0057-0061 and FIG. 4 of Ozaki). Thus, the assist clutch transmission torque FF

command setting unit 102 does not use a deviation between a target differential speed and an actual differential speed for setting a first clutch torque (FF) of the clutch unit.

With regard to a5), Applicants respectfully submit that Ozaki fails to disclose a final clutch torque computing unit for computing a final clutch torque, wherein the final clutch torque computing unit computes the final clutch torque by a computation involving the first clutch torque and the second clutch torque in association with a ratio so as to suppress a wheel slippage. It is respectfully submitted that Ozaki only discloses a synthesizing unit 105 for generating an assist clutch command value by adding the feedback command value to the assist clutch transmission torque FF command value. The examiner recited that a ratio of Claim 1 is disclosed as “gear ratio of transmission” in Ozaki. Applicants respectfully submit that Ozaki fails to disclose some sort of association between a “gear ratio of transmission” and a computation of the final clutch torque.

With regard to the Examiner’s assertion that Drexel is said to teach of a differential limiting control apparatus, Applicants respectfully submit that Drexel fails to disclose a differential limiting control apparatus. It is respectfully submitted that Drexel only discloses an arrangement for monitoring the wear status of a friction clutch in the drivetrain of a motor vehicle driven by an internal combustion engine.

With regard to a6), Applicants respectfully submit that Drexel fails to disclose computing a transmission ratio, which changes according to a diameter difference of a tire. In the indicated portion by the Examiner in Drexel (col. 3, lines 10-25; col. 7, lines 57 to col. 8, lines 14, abstract), Drexel describes a clutch state detection circuit 17. The clutch state detection circuit 17 detects the end of the engagement process as below.

- (1) detected by a clutch position sensor 19
- (2) indirectly detected by comparing the value of the instantaneous input speed of the friction clutch which is supplied by an engine speed sensor 3b with the value of the output speed of the friction clutch supplied by a speed sensor 21
- (3) In the (2) method, the instantaneous driving speed of the motor vehicle supplied by a driving speed sensor 5b is used instead of the output speed of the friction clutch supplied by the speed sensor 21 for the comparison with the engine speed

Drexel describes in detail as below (on col. 7 line 61 to col. 8 line 1):

*That is, the values of the instantaneous driving speed is proportional to
the value of the instantaneous output speed of the friction clutch,*

wherein the ratio between the driving speed value and the speed value of the output side of the friction clutch is determined essentially by the transmission ratio of the gearbox of the motor vehicle during the instantaneously engaged gear and the tire diameter of the driving wheels of the motor vehicle.

As is clear from the above, Drexel involves computing the output speed of the friction clutch based on the driving speed of the motor vehicle, wherein the computation of the output speed of the friction clutch based on the driving speed of the motor vehicle is determined based on the transmission ratio and the tire diameter. In other words, the transmission ratio and the tire diameter (not a diameter difference of the tire) are in parallel relationship as a parameter for computing a ratio between the driving speed value of the motor vehicle and the speed value of the output side of the friction clutch. Accordingly, the tire diameter of Drexel is NOT used for computing a transmission ratio, and the transmission ratio of Drexel is NOT also used for computing a tire diameter. Thus, there is no mutual relation between the tire diameter and the transmission ratio of Drexel.

Accordingly, Drexel fails to disclose a transmission ratio, which changes according to a diameter difference of a tire.

Moreover, “the ration between the driving speed value and the speed value of the output side of the friction clutch” of Drexel is different from “gear ratio of transmission” of Ozaki. Thus, There is no teach or suggestion to combine with these two prior arts.

Accordingly, Applicants respectfully submit that there is lacking any form of a teaching or a suggestion in both of Ozaki and Drexel of the claim 1 features described above.

Dependent Claims 2, 3, 5-7, 9, 10-12, 26, 29, 31, 32, 34 and 35

Regarding claims 2, 3, 5-7, 9, 10-12, 26, 29, 31, 32, 34 and 35, the Examiner recited that Ozaki (figs. 1, 2; abstract, sec 0042-0046) as modified Drexel disclose the differential control apparatus as claimed 2, 3, 5-7, 9, 10-12, 26, 29, 31, 32, 34 and 35. Applicants respectfully submit that the indicated portion of Ozaki fails to disclose or suggest the features of claim 2, 3, 5-7, 9, 10-12, 26, 29, 31, 32, 34 and 35. Applicants respectfully request there be set forth where (by page and line or paragraph number) in the specification of the applied reference there is support for the feather of Applicant’s invention as each claims.

Independent Claim 36

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ozaki et al (US 2002/0005077) in view of Drexel (US 6,040,768) and further in view of Matsuno (US 6,553,303).

Applicants respectfully submit that Ozaki et al in view of Drexel and Matsuno fail to disclose or suggest the features of independent claim 36.

The same arguments presented relative to Claim 1 can be applied to this rejection since independent claim 36 shares common pertinent features as claim 1 described above.

Independent Claim 37

Independent claim 37 was withdrawn in the previous Office Action. A review of claim 37 reveals, however, that it shares some similarity with dependent claims which were previously presented and considered prior to the filing of an RCE in this case. For instance, the formula on page 49 provides an illustration of one suitable embodiment wherein the feedback and feedforward based clutch control values are weighted in association with tire diameter differences. Accordingly, it is respectfully submitted that the prior search and claim consideration for those dependent claims like those discussed above, establishes no significant burden would be involved in consideration of claim 37 with the already treated claim set. Still further, as seen from the cited Ozaki reference, the terminology “feed forward” is terminology recognizable in the art. Also, as the prior art fails to disclose or suggest in any fashion a determination of a final clutch control using feedback/feedforward clutch control units with weighted values based on a tire diameter difference value as set forth in claim 37, it is respectfully submitted that withdrawn claim 37 also stands in immediate condition for allowance.


Thus, Applicants respectfully submit that independent claims 1, 36 and 37 and their dependent claims are patentably distinguishable over Ozaki, Drexel and Matsuno, and the application as a whole stands in condition for allowance.

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Also, if any fees are due in connection with the filing of this amendment, such as fees under 37 C.F.R. §§1.16 or 1.17, please charge the fees to Deposit Account 02-4300; Order No.032405R156.

Respectfully submitted,

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